object transcending consciousness, or of anything but states of consciousness, their compounds, and relations among themselves. To speak of "matter" as a cause of our feelings is, on such a theory, meaningless; and such a cause as an inference is impossible. Matter and motion, then, are simply convertible with states of consciousness, in fact, with feelings. And when we are told that these phenomena precede and cause the states of consciousness we call sensations, emotions, thoughts, we say merely that one set of states of consciousness is antecedent and cause of certain others. We have, therefore, wholly given up the dualistic scheme and the aim with which we started, viz., that of explaining the feelings by material phenomena. We now really profess to explain the whole of our conscious states—or mind—by one set of its states or phenomena, viz., those we call matter and motion. But does Prof. Huxley not see the *petitio principii* involved in such an argument? When I am cognisant of the phenomena, matter and motion, have I not assumed consciousness and its states to account for consciousness and its states; or rather, which is worse, have I not assumed certain very elementary states of consciousness—to account for, in fact, to generate the whole contents of mind—in all their complexity and reach—intellect, emotion, desire, volition, and moral sense? This is cutting the knot coarsely with a hatchet. It is not even solving the problem as to how from rudimentary states of consciousness itself, mind can rise to its recognised fulness and complexity—rise, in a word, to that which we call matured consciousness.

J. VEITCH

SACHS'S VENEZUELA

Aus den Llanos. Schilderung einer naturwissenschaftlichen Reise nach Venezuela. Von Carl Sachs. (Leipzig: Veit, 1879.)

NO one who has a liking for natural history should omit to read Dr. Sachs' account of his adventures in the Llanos of Venezuela. German books of travel, though possessing a large amount of solid information, are often rather dry and heavy. But Dr. Sachs' volume is certainly an exception to the rule, and may, we think, be placed, as regards the interest of its narrative, nearly, if not quite, on a par with the well-known works of Bates and Wallace.

The late Dr. Carl Sachs, who was formerly assistant to the great physiologist of Berlin, Emil du Bois-Reymond, and lost his life in an unfortunate accident on the glaciers of Monte Cevedale in August, 1878, went out to Venezuela, not with the ordinary objects of the travelling naturalist, although no opportunity was lost of collecting specimens, but for the especial design of obtaining a better knowledge of that most wonderful of fishes commonly called the electric eel (*Gymnotus electricus*). No more appropriate use could certainly have been made of the "Humboldt-Fund," collected in order to preserve in memory that great naturalist, than the devotion of it to such a purpose. Humboldt's account of the electric eels and the mode of their capture, is among the best known portions of his travels. Nearly eighty years had passed without any naturalist having trodden in Humboldt's footsteps, or having attempted on the spot the further elucidation of the extraordinary properties of this fish, aided by the enormous development which the science of physiology had made since that period.

With this object, therefore, Dr. Sachs left Europe in October, 1876, determined to visit the home of the electric eels in the same streams that Humboldt had found them in the year 1800. To arrive at this destination is not in these days a matter of great difficulty. From Hamburg a swift ocean-steamer bore our naturalist to La Guayra, and a day's ride over the coast chain of the Andes brought him to Caracas, the capital of Venezuela. After a few days' spent in rest in this lovely city and in excursions in the neighbourhood, Dr. Sachs turned his face due southwards, and, accompanied by servants and baggage-mules, rode over the grassy plains, or Llanos, which cover the southern part of the republic. Ten days' travel brought him to the little village of El Rastro, situated on one of the small confluents of the Rio Sisnado, a branch of the Orinoco, the very spot where Humboldt had captured *Gymnoti* seventy-six years before.

Humboldt's account of the mode in which this operation was effected in his days is well known. The Indians "fished with horses." About thirty wild horses and mules from the Llanos were collected and driven into the river. The stamping of the beasts drove the eels out of their hiding-places in the mud into the middle of the stream, where they got under the bellies of the horses and attacked them with repeated discharges of their electric organs. The unhappy quadrupeds rushed out to the banks, but were driven back into the water by the shouts and sticks of the surrounding Indians, until many of them, exhausted by the repeated shocks of the *Gymnoti*, sank to rise no more. The eels thus lightened of their superabundant stock of electricity were easily captured by the Indians.

Such is Humboldt's well-known story. But strange to say the Venezuelans of the present day simply laughed when Dr. Sachs proposed to put a similar plan in operation, and said they had never heard of such a thing. Indeed Dr. Sachs after various inquiries on the subject, was at last driven to the conclusion that fishing for electric eels with horses, as described by his illustrious countryman, must have been quite an exceptional occurrence, and could never have been a recognised custom.

In fact, Dr. Sachs was altogether unsuccessful in inducing the people of El Rastro to procure him electric eels in any way, and, after some rather disheartening attempts, shifted his quarters to the neighbouring town of Calabozo, where he hoped to find better quarters and a more intelligent set of assistants. Here, also, although his offers for electric eels were raised to ten pesos (about 30*s.*) a head, the fishes did not "come in," and poor Dr. Sachs was almost beginning to despair, when he fortunately heard of a certain "Llanero"—General Guancho Rodriguez—the very man for the occasion. How under Don Guancho's generalship these redoubtable eels were at length captured and brought home to the doctor's laboratory at Calabozo, how the necessary experiments were conducted to the wonderment of the good Calabocenos, and how Christmas is passed in that city, is all well told in some entertaining chapters, which will be much appreciated by those who read Dr. Sachs's narrative. It musts suffice for us to say that during Dr. Sachs's stay at Calabozo, which lasted until March, 1877, the main objects of the expedition were fully attained, and a number of important researches

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carried out, the results of which, owing to Dr. Sachs's untimely decease, will, we fear, never be given to the public.

Leaving Calabozo, Dr. Sachs continued southwards to San Fernando de Apure, and thence down the Apure and Orinoco to Ciudad Bolivar, the capital of this part of Venezuela. From Ciudad Bolivar steam quickly carried him to Trinidad, and thence back to Europe. Of this section of his journey, as of the former part, Dr. Sachs's narrative is full of interest—nor will any one who reads it fail to regret that so promising a life should have come to such an early conclusion.

OUR BOOK SHELF

Education as a Science. By Alexander Bain, LL.D. (C. Kegan Paul and Co., 1879.)

THIS work, belonging as it does, to *The International Scientific Series*, naturally calls for some notice in our columns. We must confine our remarks, however, to the portions which deal with Mathematical, Physical, or Natural Science. The author, though Professor of Logic and English Literature, has already appeared before the public as one of the Editors of *Arnott's Physics*, and has laid down the law in a somewhat peremptory way about Elementary Geometry. We expect to find, therefore, accurate science, and above all, clear and definite composition, in his work.

The first of the following extracts supplied a hint which enables us to make the book review itself. We have taken the liberty of italicising a few words, in other respects we quote *verbatim*.

"Definite descriptions of definite failures, without note or comment, are a power to punish. When there are *aggravations, such as downright carelessness*, a damaging commentary may be added; but in using terms of reprobation, still more strict regard has to be paid to discrimination and justice. The degrees of badness are sometimes numerical . . . . this very definiteness *literally stated* is more cutting than epithets."

"The phrase 'cæteris paribus' (other things remaining the same) is a mathematical coinage, for guarding against the error of supposing that a course (*sic*) will produce its effect under all circumstances indiscriminately."

"The advantages above set forth are such as Mathematics is peculiarly fitted to give, and *without which they* are scarcely ever attained at all. In so far as the physical sciences unfold similar advantages the way is paved for them by Mathematics. To this short sketch of what Mathematics does, we should, for the sake of clearness, append what it does not do, *and must be left undone*, if we stop with it."

"The *earlier* parts of such subjects as Geometry and Algebra need the *longest* iteration: the progress should be at an *accelerating* rate. The higher Mathematics should not be commenced with immature or incapable minds."

"How to embody the actual problems in mathematical language,—for example, the problems of motion in the scheme of differential coefficients,—is a standing embarrassment, not to be met by any of the arts of ordinary tuition."

"Try a child to lift a heavy weight first by the direct pull, ..."

"Many trials must be allowed to *get a child into a new shade of vowel*, as, for example, when Scotch (*sic*) children have to learn the English sound of 'all.'"

"A high wrangler is a man professionally fitted for some special post involving Mathematics; but, if he turns to one of the other professions—Law, Medicine, the Church, the Public Service, *he has incurred* an irremediable waste of human strength."

Having attentively perused these extracts, the reader will probably be prepared to consider the following statement as more than plausible:—

"A purely psychological or metaphysical education *might* be the worst case of any . . . ." P. G. T.

Life in Asiatic Turkey. A Journal of Travel in Cilicia, Isauria, and parts of Lycaonia and Cappadocia. By the Rev. E. J. Davis, M.A. Map and Illustrations. (London: Stanford, 1879.)

MR. DAVIS resides as Chaplain at Alexandria, and the present thick volume is the result of a tour in Northern Syria, in the summer of 1875. It is surprising that a region so full of interest should have been so little visited, and therefore Mr. Davis's account of what he saw is specially welcome. That there is much to interest in these parts is evident from all that Mr. Davis tells us, and his quiet and painstaking narrative will well reward a careful perusal. The pictures, coloured, from drawings by Mr. Davis, are unusually good, and add greatly to the interest of the volume, which is likely to take its place as a standard reference-work on the region with which it deals.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

Tempel's Comet

WE find in NATURE, vol. xix. p. 347, some detailed particulars about the return of the comet 1867 II. (Tempel) in the course of the present year. In this article Sandberg's calculations are also taken into account. The real value of his studies about this comet seems to be but little known, as in other instances as well, new calculations are based upon them. In the *Astron. Nach.* Sandberg has only given a very short account of the results of his researches, and it is therefore but natural that their real value must be more or less concealed. Sandberg has published the details of the first determination of the orbit in a special treatise (Specimen Inaugurale de Orbita Cometæ II., 1867, Zwollae, 1869), which seems to be not very much known, and it is not necessary to read much of this work to make sure of the negative value of the calculations.

I now take the liberty to give here some short notices, which are, however, quite proof enough to keep astronomers eventually from unnecessary calculations. Sandberg makes use of all observations, and forms the normal places by the deviations of the different observations from the provisional ephemeris. In doing this he rejects, "prompted by the example of others," (*sic*) all observations which deviate more than 1·5s. in R.A., and 20″ in D. from the *ephemeris*, and not from the average. If, for instance, as with a normal place the mean deviation comes to + 14″ in D., he rejects observations which deviate 6″ from this average, whereas he accepts others to their full value, the deviation of which from the average is nearly 30″ (– 14″ from the ephemeris).

According to this proceeding is the accuracy of his calculations. An observation of Pulkowa deviates, according to his calculation, from the normal difference in D. (– 2″·2) 21″ (18″·9). If he had taken the parallax with correct sign, the observation would deviate 4″ from the average. In the same manner the above-mentioned great deviation from the average is wrong, and does in reality only come to about 3″. These facts are sufficient. It would be easy to mention many others of similar nature, but I do not think it necessary to take up more room in your esteemed periodical.

W. VALENTINER

Mannheim Observatory, March 10

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